



# Transformation Contamination

Laurie McGhee

Biology

Colfax-Mingo High School

DuPont Pioneer

## Part I: Overview of Business

- DuPont Pioneer is the world's leading developer and supplier of advanced plant genetics providing high-quality seeds to farmers around the world. Scientists at DuPont Pioneer use the most innovative technologies to develop superior products and cut down the amount of time required to deliver new products to customers.
- Agricultural research requires long-term commitment, investment, innovation, and dedication. DuPont Pioneer researchers are leaders in the discovery, development, and delivery of elite seed genetics. The Research and Development of DuPont Pioneer is comprised of more than 4,400 researchers operating in 125+ research sites in 25 countries on six continents.

## Part II: Job Specifics

- Use the process of transformation on rapeseed plants, *Brassica napus*, more commonly known in the US as canola. Transformation a process where DNA is inserted into the genome of an organism of interest, in this case, canola.
- Transformation is important for researchers to better understand how plants respond to factors like pathogens. It is also very important economically. Researchers can develop new lines of canola and other crops like corn, wheat, or soybeans that have mutations to help make the plants more drought, stress, and/or disease resistant.
- I germinated canola seeds, harvested plant tissue, and infected the tissue with bacteria with specific genes. Those genes were then incorporated into the plant cell DNA, and if successful, the desired trait will appear in plant shoots that develop from the tissue.

## Part III: Introduce the Problem

- In order to genetically alter canola, plant tissue must be grown to harvest. Contamination at many stages can occur and ruin the trial. There has been contamination of fungus and bacteria in the boxes where the seeds are germinating.
- Students should design an experiment to determine at what point the contamination is occurring.

## Part IV: Background

- There are many steps where the contamination could be occurring. The seeds must be surface sterilized before use to kill any fungal spores or bacteria on the seed coat. Sometimes it can be difficult to kill a certain strain of fungus or bacteria and different solutions can be used (bleach, hydrogen peroxide, ethanol, etc.). It is important to kill everything on the seed coat, but not damage the seed itself.
- The transformer can use poor aseptic technique and cause contamination. For example, the germination media can become contaminated when it is made if clean, sterile materials are not used. The transformer can also cause contamination by not using sterile tools when touching the seeds and germination media, or by opening the container to pathogens in the air.

## Part V: Business Solution

- Ethanol followed by bleach has been useful in killing fungus and bacteria, but the correct concentration and length of soak is important to not damage the seed. Hydrogen peroxide followed by ethanol and bleach has also been particularly helpful with a fungus that is difficult to kill.
- DuPont Pioneer has state of the art equipment to make sterile germination media and each researcher has a laminar flow hood to prevent airborne contaminants from entering the working area. Researchers also use sterile tools and lab equipment to transfer the seeds throughout the sterilization process.

## Part VI: Student Solutions

- Boiling the water used to make the germination media, sterilizing the forceps used to move seeds using heat, trying different concentrations of cleaning agents for different amounts of time, wearing gloves, etc.